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ABSTRACT

Literature on race and age differences in college remedial and developmental studies students is surveyed, based on the current literature, including an ERIC search from 1980 to 1988, pertinent professional textbooks, and information provided by publishers. Separate sections on race and age differences are provided, and each section concludes with recommendations for the modification of instruction and testing, including: (1) instruction in remedial and developmental programs should involve a mixture of activities reflecting the learning styles of black students; (2) each lesson should be preceded with background providing context; (3) a non-academic attitudinal measure should be used to admit and place some students; (4) time limits should be removed from tests used by black students and older students unless speed is an important factor in the competence being measured; (5) criterion-referenced tests reflecting program content should be used to judge progress; (6) the same placement test should be used for older and younger students; (7) test items should have meaning insofar as possible; (8) adult remedial/developmental students should be allowed to enroll in college-level courses with the option of using a "continuation" grade, but the students should be required to use support services and remedial/developmental classes if needed; and (9) for older students, speed and time constraints should be removed from courses and support services except where speed is essential to the competency. Contains 22 references. (KM)

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RACE AND AGE DIFFERENCES IN INSTRUCTION AND TESTING

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Race and Age Differences

In Instruction and Testing

Executive Summary

This report is the result of an organized survey of literature on race and age differences in remedial and developmental studies students. It reflects a thorough search of current literature, including an ERIC search from 1980 to 1988, a review of pertinent professional textbooks, and a survey of information sent from publishers like Educational Testing Service (ETS). The report has two major divisions, Race Differences and Age Differences. Each section contains a sampling of information from current literature. In these sections a considerable amount of information has been derived from the acumen of experts while other information has come from specific research projects. Each section of the report is terminated with a summary section. These sections offer "suggestions" with support in literature.

The results of this investigation led to the notion that good testing and instruction can be modified to serve the needs of students in several ways.

Suggested modifications for race include: 1) instruction in remedial and developmental programs should involve a mixture of activities reflecting the learning styles of black students. This would involve using inferential as well as deductive reasoning, cooperative as well as competitive tasks, verbal as well as analytical exercises, and content that reflects a social and human context; 2) instructors should precede each lesson with background information

that puts new information into a context; 3) non-academic attitudinal measures should be used for the admission and placement of some students; 4) time limits should be taken off tests used by black students unless speed of work is an important factor in the competence being measured; 5) criterion referenced tests that are valid reflections of program content should be used to judge student progress.

Suggested modifications for older students include: 1) use the same placement test for older students and younger; 2) take the time limits off the tests used by adults unless speed of work is an important competency being measured; 3) insofar as possible, use test items which have meaning (adults should perform better and younger students should do as well); 4) allow adult remedial/developmental students to enroll in college-level courses with the option of using a "continuation" grade but require that they make use of support services and of remedial/developmental classes if needed. Whenever possible, these decisions should be the self-directed decisions of the older student; 5) remove all speed requirements and time constraints from courses and support services except where speed is an essential part of a competency.

Race and Age Differences in Instruction and Testing

In this report, research related to testing and instruction has been assimilated to answer questions about remedial and developmental students in higher education. Particular attention has been given to questions of race and age, with the scope of the report encompassing questions concerned with how underprepared students, white and black, young and old, respond to testing and instructional practices.

Information for this report has been gleaned from current literature and research in adult and higher education. Documents from Educational Testing Service (ETS) have been reviewed to get up-to-date information on test development practices and procedures. In addition, information on what researchers view as a higher education "Best Practice" was sought through several ERIC searches. Finally, several professional textbooks were surveyed to acquire background information on racial and age differences in testing and learning. In substance, the report is a review of the literature, followed by a brief summary of what research suggests to be a best practice.

Racial Differences

The first, and probably the most highly charged, issue in this report is the recognition of racial differences in higher education. This issue has become more and more visible since the decade of the 60's, but is still nonetheless perplexing. It is surrounded with questions of "equity" or equal opportunity for all students in colleges, universities or other academic communities. In a Change magazine editoral, Laura Bornholt (1987, p. 6-7) called for a second

generation effort to bring blacks into the mainstream of higher education, claiming that the first twenty-year effort had "fizzled." She wrote that "the presence of blacks in higher education... falls woefully short of where men and women of good will hoped and trusted it could be by 1987." Hale-Benson (1986), in her book, Black Children: Their Roots, Culture and Learning Styles, points out that whereas 75 percent of white high school seniors go to college only 20 percent of black students do so. Of those black students who start college, only 12 percent finish.

Performance

Futhermore, the performance of black students on standardized tests falls short of that of white students. Data from ACT College Student Profiles:Norms for the ACT Assessment (1987-88) reveal the ACT scores and high school grade-point averages for groups of black and white students in a 1986 sample (Table 1).

Table 1

ACT Mean Scores and High School Averages for Afro-American/Black and Caucasian-American/White Students

	English		Math		Social Studies		Natural Science		Composite ACT	
	B	W	B	W	B	W	B	W	B	W
ACT										
Mean	14.7	19.7	11.1	18.9	12.4	19.2	16.0	22.7	13.7	20.3
S.D.	5.3	4.8	7.1	7.5	6.4	6.7	5.5	5.9	5.1	5.3
GPA										Average
Mean	2.67	3.05	2.39	2.77	2.82	3.15	2.58	2.93	2.62	2.98
S.D.	.84	.81	.95	.97	.88	.82	.88	.87	.64	.67

ACT N for white = 36,013 and ACT N for black = 3,037
GPA N for white = 33,747 and GPA N for black = 2,704

Joan Baratz-Snowden, director of the Education Policy Research and Services Division at Educational Testing Service, has been able to document the progress of black student test performance over a period of years. She presented her findings in an article entitled "Good News, Bad News: Black Performance on Standardized Tests" (1987). As the title suggests, the good news is that between 1971 and 1984, black student reading achievement (test performance) has been not only increasing but increasing at a rate faster than that of white students.

The bad news is that black students have not caught up with white students and are unlikely to do so any time soon. Baratz-Snowden (1987) cites the interesting National Assessment of Educational Progress (NAEP) statistic that shows that the average reading achievement of (in-school) black students aged 17 is not significantly different from the average reading achievement of 13-year-old white students. Further, an examination of the NAEP achievement data for white and black students confirms that this achievement gap begins very early. Baratz-Snowden also reports that recent studies (Kennedy, Yung and Orland cited in Baratz-Snowden, 1987) showed that both length of time in poverty and attendance in school with high proportions of poor children are negatively correlated with achievement. In other words, poor children who attend schools for the poor have little chance of reaching the levels of achievement required for college-level work.

This same pattern is evident for black students when college-level testing programs like the Scholastic Aptitude Test (SAT)

are examined. While SAT test data may not be entirely representative of the college-aged black student population, it nevertheless provides valuable information for a large number of college-bound students. Baratz-Snowden (1987) reports that average SAT test scores for blacks have improved over the last nine years. From 1976 to 1985 the average scores on the verbal section of the test improved 14 points while the average score on the math section improved 22 points.

However, blacks fall significantly behind white students on each of these tests. Baratz-Snowden (1987) makes an interesting comparison of achievement growth rates indicating that if one looks for equity of scores on the ACT test, at the present rate it will be the year 2045 before blacks and whites perform in a similar fashion and 2035 before they do so in math. But, continues Baratz-Snowden, the mean performance does not tell the whole story.

When data from groups of students scoring 500 or better on the SAT are examined, another picture emerges. In 1985, 7.9 percent of the black students scored better than 500 on the verbal section of the SAT, and 12.9 percent scored better than 500 on the math section. In the same year, 31.4 percent of the white students taking the SAT scored above 500 in the verbal section while 48.2 percent scored above 500 on the math section. This means that white students are four times as likely to score over 500 as are blacks. Once again, while these scores represent improvement over the years, the numbers of black students scoring over 1000 in a combined score is according to Baratz-Snowden "unacceptably low."

In research recently conducted for the Tennessee State Board of Regents by the Center for the Study of Higher Education (1987), Memphis State University suggests that speededness may be a factor in the lower performance of black students on standardized tests.

Culturally Based Differences

Overall, the research suggests that the significant differences between the performance of black and white students are culturally based. Hale-Benson (1986, p. 177-8), citing a recent report by the National Alliance of Black School Educators (NABSE), contends that there has been an "erosion" of achievement in higher education. She claims, "... education of white children is relatively more successful than that of Black children because the schools are designed for white education." Hale-Benson (1986, p. 179) continues her discussion of racial differences with the contention that "Black children are defined in white terms because white children are considered by psychologists to represent the norm." Pejorative terminology marks this issue. She writes (p. 180), "When Black children do not approximate the norms for white children, they are regarded as deficient, deviant, or pathological...(p. 180). She contends that "Black children across social classes are at risk in the traditional educational process" (p. xv). She emphasizes that learning styles are rooted in culture and the key question is whether black children as an ethnic group need their own pedogogy.

Learning Style Differences

Shade (1982) in her review of literature describes culturally-based learning styles. She cites Milliard (1976), who

suggests that Afro-American people a) tend to view things in their environment in entirety rather than in isolated parts, b) seem to prefer inferential reasoning rather than deductive or inductive reasoning, c) tend to approximate concepts of space, number, and time, rather than aim at exactness or complete accuracy, d) prefer to attend to people stimuli rather than non-social or object stimuli; and e) tend to rely on nonverbal communication patterns as well as verbal communication. As a result of her literature review, Shade (1982) concludes that there is evidence to suggest that Afro-Americans are more field-dependent than Euro-Americans; that they tend to categorize their world using more finely discriminated classes than Euro-Americans at all achievement levels; and that these variations in cognitive patterns seem to be associated with performance in school.

Anderson (1988) differentiates between western (Euro-American males) and non-western (including African Americans) world views on several fundamental dimensions (Table 2).

Table 2

Western vs Non-western Worldviews

Non-western	Western
. Emphasize group cooperation	. Emphasize individual competition
. Achievement as it reflects group	. Achievement for the individual
. Value harmony with nature	. Must master and control nature
. View as relative	. Adhere to rigid time schedule
. Accept affective expression	. Limit affective expression
. Extended family	. Nuclear family
. Holistic thinking	. Dualistic thinking
. Religion permeates culture	. Religion distinct from other parts of culture
. Accept world views of other cultures	. Feel their world-view is superior
. Socially oriented	. Task oriented

These world views are reflected in different cognitive styles. Blacks tend to be field-dependent, relational/holistic, and affective, whereas white males are more often field-independent, analytic, and non-affective. Table 3 compares these two cognitive styles.

Table 3

A Comparison of

Cognitive Style Characteristics

Field-Dependent Relational/Holistic Affective	Field Independent Analytic Non-Affective
1. Perceive elements as a part of a total picture.	1. Perceive elements as discrete from their background.
2. Do best on verbal tasks.	2. Do best on analytical tasks.
3. Learn material which has a human social content and which is characterized by fantasy and humor.	3. Learn material that is inanimate and impersonal more easily.
4. Performance influenced by authorizing figure's expression of confidence or doubt.	4. Performance not greatly affected by the opinions of others.
5. Style conflicts with traditional school environment.	5. Style matches up with most school environments.

In the ASHE-ERIC Higher Education Report No. 4, Learning Styles: Implications for Improving Educational Practices, Claxton and Murrell (1987) dichotomize the learning styles of black and white students as relational versus analytical. They tentatively conclude "that black children are oriented primarily to a relational learning style." This style is "global and subjective and views information in its own context." White children tend to be analytical, which "is parts specific and objective and views information as it is rather than in

its context." Schools currently focus almost entirely on the analytical learning approach. Claxton and Murrell (1987) call for a mixture of activities anchored in both styles.

Research Implications

The implications of the research are significant for testing and instruction. Over the years, racial test bias has been looked at from a number of perspectives, which Rosenbach (1979) describe as: popular (naive); clinical (intuitive); statistical (predictive); psychometric (construct); and psychometric (content). The popular (naive) view is that the fact that blacks consistently score lower than whites on various aptitude tests is sufficient evidence to support a claim of bias. The clinical (intuitive) view consists of observations by clinicians who, in working with individual children, become convinced that they are more capable than the results of standardized tests indicate. The statistical (predictive) line of research consists of examining whether a common regression line is appropriate for predicting college success for both black and white students. The psychometric (construct) approach to test bias was introduced by Jensen (1976). This consists of examining the internal structure (e.g., internal consistency reliability, rank order of item difficulty) of several well-known test instruments for white and black groups. Finally, the psychometric (content) approach involves using a test that is culture-fair for lower class, black students.

In terms of the naive view, virtually all statistical reports of standardized test scores show mean scores for black students lower than mean scores for white students. In a comprehensive review of

population validity studies examining the statistical (predictive) value of college entrance exams, Breland (cited in Nettles, Thoeny, & Gosman, 1986) concluded that "when identical regression equations are applied to black and white students, the tendency is to overpredict the college performance of black students." Rosenbach (1979), in his review of the literature in each of these five categories, concludes that "most claims of 'test bias' are basically unfounded, especially for those tests which are used to predict success in school." This conclusion is supported by Sandber & Millman (1987) in their meta-analysis of 40 studies on racial differences in the predictive validity of standardized tests. They conclude that "tests as predictors of future performance are as 'good' or 'bad' predictors for blacks...as they are for whites...." Rosenbach asserts that the bias is not in the tests, but "in the nature of what is being predicted, i.e., in the criteria." He observes that whereas performance on most well-known test instruments is an accurate predictor of school success as measured by grades and achievement test scores, there is little evidence in the research to support any connection between success in school to success out of school (see, e.g., McClelland (1973) or Wallace & Wing (1969)).

Despite the evidence that entrance exams accurately predict school success for both black and white students, there is also evidence that a variety of other variables are significant predictors of school success. Nettles, Thoeny, and Gosman (1986) found that "a variety of academic, personal, and attitudinal/behavioral characteristics, both pre-college and in college, were significant

predictors of CCGPA (cummulative college GPA)." They support the use, by colleges and universities, of broader admissions policies that take these variables into account.

Instructional Approaches

Astin (1982), in his book Minorities in American Higher Education, reports the findings from the longitudinal analyses of factors that influence educational achievement. He found that the greatest predictor of college grades for all students was high school grades. Whereas standard admission test scores contributed to the prediction of college grades for black students, "the magnitude of the relationship is quite small in comparison to the relationship between high school grades and college grades." Astin (1982) argues that standardized tests should not be used as a means of screening or selecting students because their values as predictors of educational outcomes are limited. Instead, he suggests that standardized tests be used "for evaluating student progress, for placing students in appropriate courses, and for assessing the effectiveness of educational programs at all levels."

Hale-Benson (1986) concludes that, for instruction, the pedagogy in the typical school program will have to change before black student achievement can be equated with that of white students. She recognizes, however, that this is not likely to happen in a system or culture that is controlled by a white majority. Therefore, the tests used to gauge student achievement will continue to favor whites because they are perceived to be the "norm" group regardless of what the data suggests.

Moore (1985) advocates a more conservative approach. Rather than radically changing the pedagogy to reflect the Afro-American culture, he suggests changing the environment in which the student is forced to learn to approximate a white, middle-class environment. This involves instituting a great books program to broaden students' knowledge and a requirement to subscribe to Time or Newsweek to keep abreast of current issues. These would serve to sharpen reading abilities and lessen cultural deficits faced by black students.

Still a third approach is to address the needs of black students through predominantly black colleges. A recent issue of the Chronicle of Higher Education carried several interesting articles concerned with racial issues in higher education. The first article by Merry Hayes (1988, July 27) documents an increase in enrollment at predominantly black colleges. She cites three reasons for the increase: 1) special support programs that black colleges offer, 2) a renewed interest in black culture, and 3) aggressive recruitment. The feeling persists that black colleges may be in a better position to understand the problems of the black student. An official at Fisk University was quoted as saying, "Students were returning to black colleges because the colleges have academic credibility and faculty members who care about them." An Institute for Services to Education (1979) study examined the correlation between standardized college admissions tests and life achievement of students attending historical black colleges. The findings indicated that participants were able to achieve considerable academic and career success despite low initial scores on standardized tests.

In the same issue of the Chronicle, Martin Haberman (1988, July 27), Professor of Education at the University of Wisconsin at Milwaukee, calls for an alliance between two-year and four-year institutions. He believes this partnership would enable black students to enter the teaching profession via a transfer from the cheaper two-year colleges where black students start their education and have a more supportive environment. With this start, blacks could then move to the four-year institutions where they would complete the requirements for a bachelor's degree.

Summary

The message from this information is clear. While achievement of black students has been improving through the years, it is still well below that of white students. These differences appear early in the schooling of black students and grow progressively worse as they approach higher education. Current conditions do not indicate that these racial differences will be made up soon. Cycles of poverty must be broken and school improvements must be made before there can be a chance of equity. Black educators are calling for a second effort to eliminate observed differences between the races. They suggest that teaching strategies and test-taking procedures will have to be altered before parity can be established.

Suggestions

1. Instruction in Remedial/Developmental programs should involve a mixture of activities reflecting the learning

style of black students. Teaching methods and assignments should involve:

A. inferential as well as deductive reasoning;

B. cooperative as well as competitive tasks;

C. verbal as well as analytical tasks;

D. human, social content as well as inanimate content;

2. Instructors should precede lessons with appropriate background discussions.

3. The limitations of standardized tests as predictors of success should be recognized, and program administrators should incorporate other non-academic, attitudinal measures for admission and placement purposes.

4. The time limits should be taken off the tests used by black students unless the speed of work is important in the competency being measured.

5. Criterion-referenced tests that are valid reflections of program content should be used as opposed to norm referenced tests.

Age Differences

Introduction

Age difference is the second concern of this report. This is an important consideration because a number of adult students are enrolled in remedial/developmental programs in SBR institutions. It is important to recognize that these students are known to respond

differently to testing procedures and instruction and, as such, create a need for alternative procedures in any program. This need has led to the current literature review on test performance and learning characteristics of older students. It is a review of what is known about the ways in which older students differ from younger students.

The task was approached with the intention of making use of recent reviews of literature supplemented with additional, more current, references that may not have been incorporated into other reviews. The sources used for the review were: Stephen Brookfield's 1986 book entitled Understanding and Facilitating Adult Learning; a chapter entitled "Intelligence" written by K. Warner Schaie and Joyce Parr in Authur Chickering's 1981 book, The Modern American College; Patricia Cross's 1981 book, Adults as Learners; and, finally, a 1981 book by Alan B. Knox entitled Adult Development and Learning.

In the review, more was found about adult learning than about adult test performance, except for performance on tests of general intelligence. With respect to adult learning, the information found was more speculation and observation, however well informed, than empirical evidence. Adult education is a large and busy field, and there have been many attempts to find dependable principles or "theories" of learning, as differentiated from principles that are valid regardless of the learner's age. The results are not spectacular. As Brookfield says, "There can be few intellectual quests that, for educators and trainers of adults, assume so much significance and yet contain so little promise of successful

completion as the search for a general theory of adult learning" (Brookfield,1986, p.25).

Adult educators represent quite a mixture of fields. Some deal, as the SBR's remedial/developmental program does, with instruction in academic subjects, some with vocational education, some with education in basic literacy skills, some with continuing education for enjoyment, some with industrial education, and so on. Some of the literature about adult learning and testing comes from, or is intended to apply to, each of these. This review is restricted to information that seems to be relevant to remedial/developmental instruction at the college level. This does not mean that there is much literature about adult learning specific to college-level remediation; there certainly is not.

Adult learners are varied as to age. The term generally applies to people just beyond the typical college freshman age, even as young as 21, and to those who are well into old age. This report has not been restricted to literature dealing with younger adults, even though the vast majority of adults in the remedial/developmental program are in their teens or early twenties. There are two reasons for this: first, there are a few people in middle age who enter the program, and, second, most of the differences between late teenagers and adults, as far as learning is concerned, do not exist in significant proportions until well into middle age. Without the really older learners, there really is not much to be said.

The review is restricted in terms of the range of "adult learning" topics it covers. It addresses primarily, those variables

which have to do with adult abilities (intellectual, sensory, and perceptual) which affect the way one learns and characteristic modes or approaches to learning. These areas may be useful in policy-making and curriculum design for adults. Within each area an attempt has been made to identify some practices which might be considered helpful. The report does not include, except tangentially, the vast literature about adult development, life cycles, stages, and phases. While these are very important in deciding how to test and teach adults, they are outside the scope of this report. The best single source for research in these areas is Chickering's The Modern American College.

Brookfield

In his review of attempts over the past 25 years to identify adult learning principle, Brookfield cites these as the most important conclusions (1986, p. 31):

1. Adults learn throughout their lives, motivated most often by changes in their stages of life.
2. Adults differ greatly in their styles of learning and cognitive procedures.
3. Adults lean toward learning things that have immediate application and meaning in their particular life situations.
4. Past experiences are very influential in adults' learning, sometimes an interference and hindrance, sometimes useful.
5. For learning to be effective, adults need to conceive of themselves as capable learners.

6. Adults exhibit a tendency to be self-directed in their learning.

In addition, Brookfield cautions the reader that most ideas about adult learning, whether the product of empirical study or from observation, are derived from experiences with white Americans from lower-middle class and higher socio-economic levels and, thus, should not be generalized broadly.

In discussing how principles can be used when they seem to fit an individual learner, Brookfield devotes himself principally to one of them, the characteristic of self-directedness. He indicates that, while not all adults are inclined to participate in the management of their own learning, most are and this means that their goal setting and instruction should be highly individualized. This approach also takes advantage of two other important characteristics: 1) adults need to have meaningful connections between their learning activities and their immediate life situations, and 2) adults have many life-experiences that are helpful in making the connections with new knowledge and skill. Brookfield also points to the need for providing learner peer groups (classes perhaps) and for determining the extent to which the learner is self-directed. He believes the instructor should be flexible in setting goals, identifying resources, and teaching.

Schaie and Parr

The chapter by Schaie and Parr (Chickering, 1981) reviews information about changes in intelligence from teenage to old age and

reports some of Schaie's own research in that area. The material has relevance to both test performance and learning.

With respect to aging changes which affect learning, the authors mention these conclusions:

1. Visual acuity begins to diminish between ages 35 and 45, along with increased difficulty in distinguishing among some colors. Additional visual difficulties often arise from about age 55 on. All of these difficulties can be accommodated, ordinarily, by lenses and brighter illumination and should impose no difficulty for learning.
2. Problems of auditory acuity may appear and increase with age from the mid-thirties. If accommodated prosthetically, and the teacher is aware of them, these should not be a significant barrier to learning.
3. Older persons, particularly beyond age 60, have lower perception and response time. These learners require slower presentation of tasks and materials with longer wait-time for response.
4. As people grow toward middle age, the relationship between the material they seek to learn and their own personal-social needs becomes more important.

5. Most measured intellectual abilities which are important for educational advancement, such as verbal and number skills, do not change significantly until somewhere around age 70, if they are measured without speed requirements. Problem solving skills measured by meaningful tasks may even improve well into middle age. These abilities, which are relatively stable until old age, are referred to as "crystallized" intelligence.
6. Abilities often referred to as "fluid" intelligence do peak in early adulthood and begin to decline. They include immediate memory, figural relations and inductive reasoning.
7. There is more variability in distributions of measured ability for adults than in distributions for younger people. This presumably reflects the influence of a greater variety of experience among adults.

Schaie and Parr make a number of observations which are important for testing adult abilities and for predicting educational achievement for adults. They say that "omnibus" intelligence tests have been quite useful in predicting one's competence to deal with the traditional educational system. But the educational system is geared to children and young adults, and the kind of intelligence tests referred to are individually administered and not commonly used in higher education placement. Thus, the question of test appropriateness

comes up. Shaie and Parr say, "Assessment strategies that have proven successful for the selection and counseling of young adults for particular educational programs may ... be quite useless and misleading when applied to older adults" (p.121).

What these authors say about testing adults' abilities and predicting adult educational progress follows:

1. Tests should be chosen or constructed in terms of the specific accomplishments or skills being predicted.
2. "Test items should be meaningful and embedded in the life experience of the adult" (p. 122).
3. Test norms should reflect the adult's performance in terms of a criterion appropriate for the activity for which the adult is being selected. The norms should not compare the individual to others of the same age, because few adults may be involved in the activities being considered, particularly if it is further formal education.
4. One well documented fact about adult ability is the slowing of perceptual and response speed. Therefore, tests to determine what adults can do should be "power" tests, except in situations where speed of response is a required aspect of the activity being learned. Further, small-sized type, anxiety producing instructions, and other test features which slow the test-taker down should be eliminated.

Finally, the authors make an excellent point about the education of older students in highly structured, standardized educational programs.

> "Individual variability in almost every type of intellectual capacity increases across the life span. The greater range of individual difference in adulthood should be of primary concern to the educator. Extreme individual differences in any student population (for example, exceptional children or disadvantaged children) has usually required an individualized approach. Such an individualized orientation would seem imperative for adults" (p.133-134).

Knox

Knox (1977) wrote a highly documented review of adult development and learning that is still used widely as a reference. Among the careful observations he made from the literature are:

1. Adults underestimate their learning ability and perform below tested learning capacity.
2. There is an increased range of individual differences in learning ability, at least through age 50.
3. While cross-sectional studies show a gradual decline in learning ability, problem-solving, and critical thinking during adulthood, longitudinal studies show great stability during adult years.
4. Fluid intelligence, such as short-term memory and abstract reasoning, declines after adolescence; crystallized intelligence, such as general information and formal reasoning, increases gradually through adulthood. General learning ability, a composite of both, remains fairly stable.
5. Much of the decline in ability during adulthood is a function of the speed deficit. Older students tend to lose speed and emphasize accuracy.

6. Older people have more difficulty remembering new material than do younger people, especially when called upon to recall old material while committing new material to memory.
7. As people grow older, transfer of learning declines. It is more difficult to apply material learned in one situation to another.
8. Older people tend to be more cautious in a learning situation than younger people, and older students handle complex tasks and irrelevant material less well.
9. Recent participation in educational activities is positively related to learning effectiveness of adults.
10. The cognitive structures, or views about a given subject, are more complex or detailed for adults because the relevant experience of the adult is greater.

Knox has a number of valid suggestions for adults that help them capitalize on their experience. Among them are (p. 463-469):

1. Allow adults to control the pace of their learning. "Sufficient time and personal pacing can help reduce age differences in learning performance." (p.467)
2. Give adult students more practice in efforts to remember new material and relate new material to their richer store of experience and knowledge.
3. Use advanced organizing materials and frequent reviews to facilitate the learning of new material.
4. Capitalize on adults' richer experiential base by relating new material to their earlier experiences.

Cross

As a part of her book on adult learners, Cross (1981) provides a very clear and practical review of research and observation. Among the characteristics she mentions are these:

1. Crystallized intelligence, involving vocabulary, general information, and arithmetic reasoning, increases from about age 14 to at least 61.
2. Fluid intelligence, involving immediate memory, spatial perceptions, and the ability to form associations for material with no previous meaning, decreases from about age 14 to at least age 61.
3. Long-term memory does not change significantly with age after adolescence. Thus, the memory problems of older students affect the learning of meaningless material, more complex material, and those new materials which require the reassessment of things learned earlier (p. 163).
4. In middle age, vision and hearing begin to deteriorate. Corrective lenses and greater illumination often are needed, but few people younger than 65 need hearing amplification. With the usual compensations, neither vision nor hearing should interfere appreciably with learning.

5. Adults, compared with younger people, are slower. They perceive more slowly, react more slowly, and think more slowly. They also tend to apply the same pace to all kinds of tasks and tend to compensate for reduced speed with greater accuracy.
6. Through middle age, adult learners tend to be more self-directed and autonomous, with more self-confidence and higher self-esteem than they had when younger. In older age, confidence and self-esteem are reduced, and learners tend to be more withdrawn and passive.
7. Adults tend to take fewer risks in learning tasks, are less inclined to guess, and depend on solutions which worked earlier on different problems.

Cross makes a number of very practical suggestions about teaching adults. Some which would apply to a collegiate setting are:

1. New information offered should be meaningful. Its association with things learned earlier or its application to immediate problems should be made explicit.
2. New information should be submitted at a slow pace to permit mastery learning. When possible, the submission of one new idea at a time should minimize competing intellectual demands.

3. Advanced organization of that which is to be taught should be provided, and material should be summarized frequently.
4. Adults' greater autonomy and self-direction Approaches to teaching and options for learning should be individualized.
5. Except when speed is clearly a part of the competency being sought, speed should be de-emphasized and accuracy should be emphasized.

Learning Style

One of the dimensions of learning which has received increasing attention in recent years has to do with individual differences in the "style" with which one perceives and processes material to be learned. There are several systems for studying these learning styles, with different descriptive terms and different categories for classifying them. A cursory look was given this literature to identify any information which might describe useful differences between adults and learners of traditional college age.

Recent reviews by Brookfield (1986) and Claxton and Murrell (1987) mention "field dependence" as one of the learning style variables which has been researched a great deal. Most authorities agreed that one becomes less field-dependent, less in need of externally imposed structure and context in learning, as one grows older. However, Brookfield reports a study (p. 43) using the Kolb Adaptive Style Inventory which showed successful adult learners to be,

in Kolb's term, "accommodators" and thus like field dependent learners. Brookfield interprets this to mean that adults tend to depend on interactions with one another in forming their conclusions.

Claxton and Murrell review many different approaches to describing and classifying learning styles, few of them reflecting on any characteristics which may differentiate the old from the young. However, they do report two such studies (p. 45-46). One of them, using a variety of tests, showed adults to be more oriented to pursuing knowledge as opposed to grade, less competitive, more participative, and more self-responsible. The other, using the Canfield Learning Style Inventory, came up with contrary findings - that older students are less affiliative, preferring traditional structured learning formats, with less independence.

In summary, learning style research does not seem to contribute much to an understanding of differences between adult students and those of traditional college age or to suggestions for accommodating adult learning styles. On balance, those who write about learning styles would seem to confirm the notion that older learners are more self-directed and that they are better able to take responsibility for their own learning.

Performance on College Entrance Examinations

ACT's College Student Profiles (1987, p. 55-58) reports on the ACT scores of people who enrolled as freshmen at the usual age and at older age. These are shown in Table 4.

Table 4

Mean ACT Scores by Age of College Enrollment[1]

	Age 17-19	Age 20-25	Age 26-35	Age 36 and Older
Composite	19.6	15.1	15.9	15.6
English	19.1	15.1	16.2	16.8
Mathematics	18.2	12.3	11.9	10.7
Social Studies	18.4	14.3	16.4	16.8
Natural Sciences	22.0	18.0	18.8	17.7

The data can be interpreted to mean that less capable students enroll later in college than more capable ones, or that the abilities measured by the tests deteriorate with age. In view of the fact that intelligence tests show deterioration in some areas but not in all, while all of the ACT scores deteriorate, the first interpretation seems more plausible. At any rate, it is worth noting that it is in the more technical areas, math and sciences, that the older freshmen differ most from the younger, and that there is no appreciable consistent change after age 20 except in math.

The College Board's ATP Guide for High Schools and Colleges (1987, p. 26) reports a study of adults' SAT scores from testing in 1985-86. The results are in Table 5.

1. Adapted from ACT's College Student Profile (1987).

Table 5

Mean SAT Scores of Adults with Approximate Precentile Ranks in Terms of College-Bound Senior Norms[2]

		Verbal Scores		Mathematics Scores	
Age	N	Mean	Percentile Rank	Mean	Percentile Rank
20	6,935	371	28	433	38
21-24	8,600	394	35	438	39
25-29	2,867	427	43	443	41
30-39	1,527	464	62	422	35
40 and older	1,751	427	43	438	39

Except for the verbal scores of the 30-39 year olds, the adults earned lower scores than the high school seniors. The alternative interpretation options mentioned above for ACT scores can be used here as well. There is no deterioration of these adults' scores with increasing age, not even in mathematics.

Summary

When writing about adults, educators may be referring to people as young as the early 20s or as old as the 70s and 80s. Sometimes they tend to generalize as if very young and very old adults are more alike than young adults and teenagers. But some observations do differentiate among adults, by age, and these allow for more specific descriptions of learner characteristics.

2. Adapted from the College Board's ATP Guide for High Schools and Colleges (1987).

On the whole, it may be said that the learning principles which hold for young people hold for older people as well. Too little is known about the ways they differ to come up with a set of learning principles which generalizes well to all adults. Age beyond that of the traditional student should not be regarded as a barrier to learning, given the usual kinds of aids for reduced sensory acuity, when necessary, and some extra time. While there are some changes in mental abilities with age, those abilities which improve with age tend to offset those which are reduced, with the result that total learning capabilities are stable. Virtually all of the authorities emphasize that adults are capable of learning anything younger students can learn.

The most useful and best substantiated observations about older learners are that they are slower and more self-directed than younger people and that material must be more meaningful or significant to their lives in order for them to attend to it or learn it easily; learning things which are relatively meaningless is something children do best.

Even less can be said about the ways adults differ from younger people in their performance on tests. The tests which have most relevance to collegiate education, and which have been studied for age differences, are intelligence tests and college entrance examinations. The intelligence tests show a loss of immediate memory and associated skills from the teen years to old age, but growth in general information during the same period and stability in most verbal and numerical skills. College entrance examinations show

little change from age 20 into early middle age except for mathematics skills which diminish the longer one is out of secondary school. Adults can be expected to do best on test items which are meaningful in the context of their lives. All authorities agree that time limits on tests are biased against adults unless the tests are being used to determine how fast one performs.

Suggestions

1. Use the same placement tests for older students and for younger.
2. Take the time limits off the tests used by adults unless speed of work is important in the competency being measured.
3. Insofar as possible, use test items which have meaning. Adults should perform better, and younger people should perform as well.
4. Allow adult remedial/developmental students to enroll in college-level courses with a "continuing" grade option, requiring that they make use of support services, and/or remedial/developmental classes, to compensate for their deficiencies according to their own direction.

5. Remove from support services and classes all speed requirements and time constraints except those which are an essential part of the competency being taught.

Concluding Recommendations

There are few principles of "black learning" or "adult learning" on which authorities agree consistently. Those few on which there is fair consensus have been presented as suggestions at the end of each of the two sections of this report. More and better empirical research is needed. This is particularly true in the area of test performance, where black-white differences are so pervasive that further understanding is essential. To make the most productive use of this report, it is recommended that the following take place:

1. The suggestions made in this report to the staff of the State Board of Regents should be reviewed by the developmental education directors in the system to determine which of the suggestions seem feasible and useful in daily practice.
2. When it is possible to identify those institutions in which older students and black students in the remedial/developmental programs progress best, a study should be done to identify those practices which distinguish them from their sister institutions. This may be the best way to formulate testing and teaching principles which are most valid for this particular program.

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